

Free Body Diagrams and Vectors

Free Body Diagrams

- Purpose: To make your life easier
- FBD: Represent objects in real life with simple shapes
- Examples:

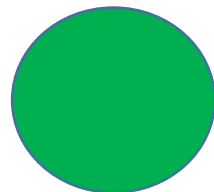
Car =



Plane =



Wheel =



Vectors Quantities vs. Scalar Quantities

- Scalar Quantities:

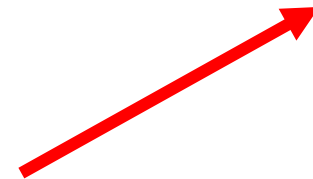
Measure magnitude

Examples:

- Vector Quantities:

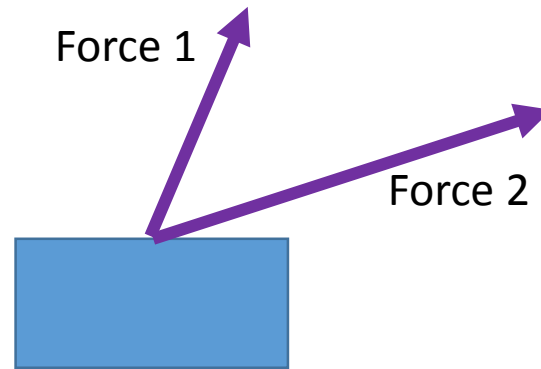
Measure magnitude and direction

Examples:



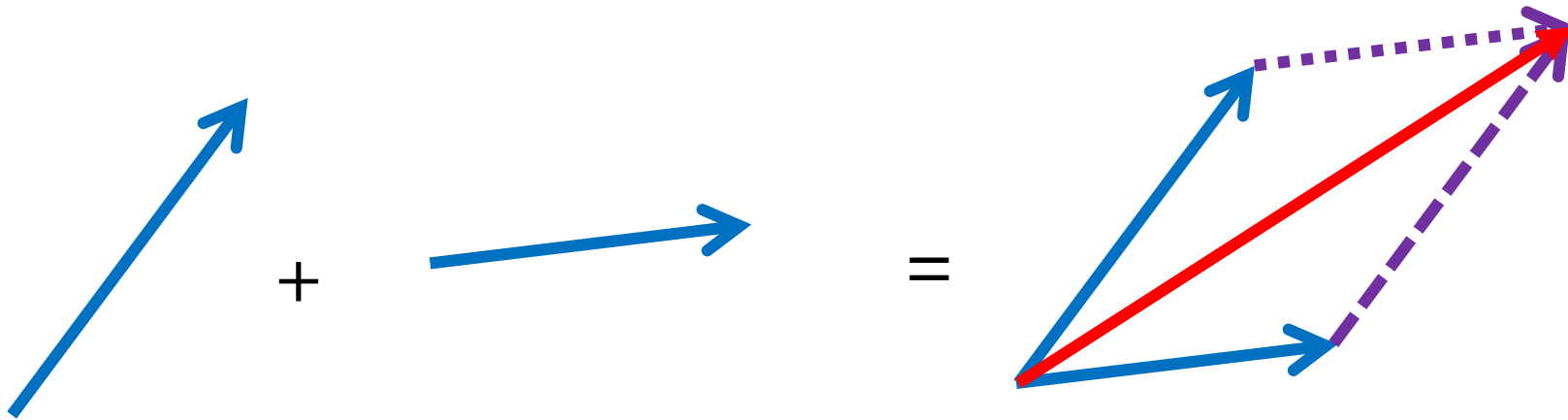
Example: 2 Forces acting on an object

- If you have two non-parallel forces acting on an object, what is the resultant vector?



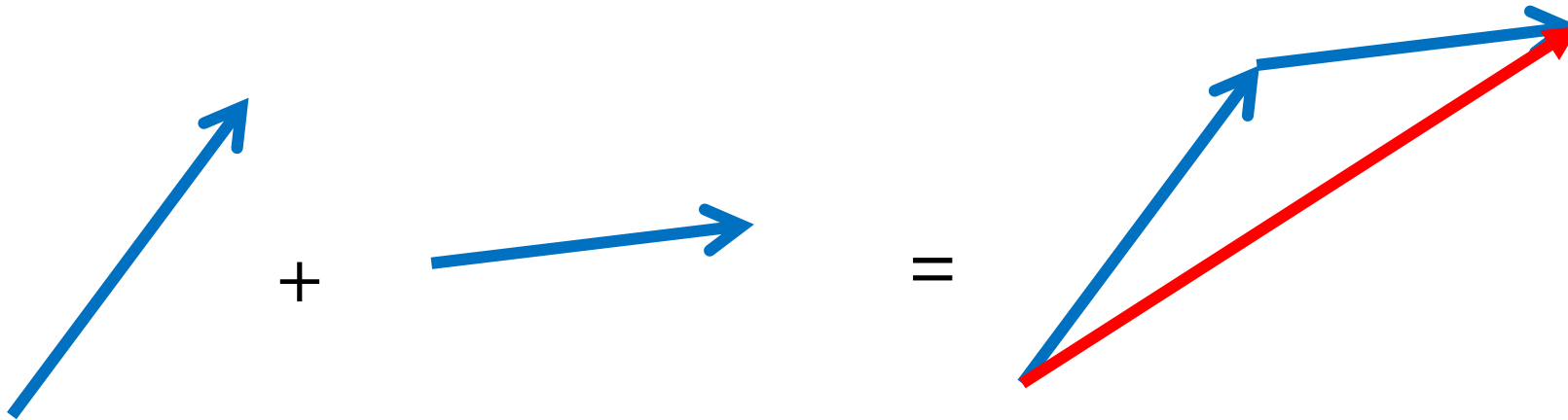
What happens if you have more than one vector?

Option 1: **Parallelogram rule:**



What happens if you have more than one vector?

- Option 2: “Tail to Nose”



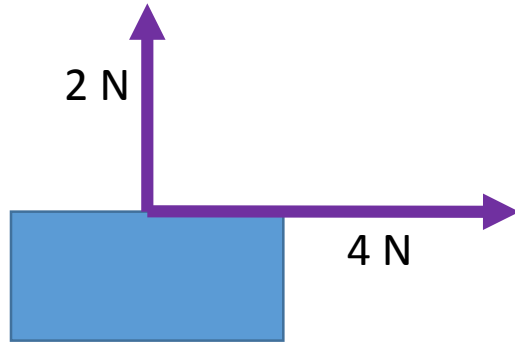
Back to the problem....

- You and your friend are still trying to move this box. What is the resultant vector?



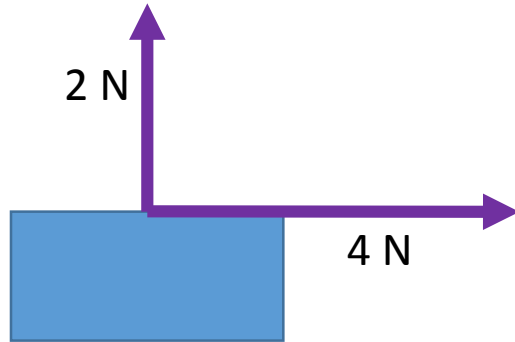
What if the vectors are acting at right angles?

- Example: You are pulling up on an object with a force of 2 N. Your friend is pulling to the right on the object with a force of 4 N. What is the resultant vector? What does this mean?



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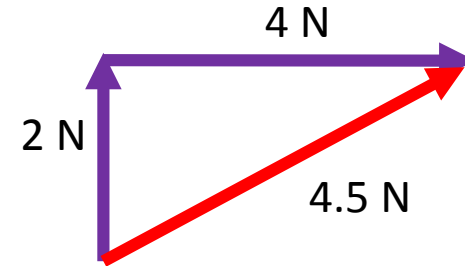
$$A^2 + B^2 = C^2$$

$$2^2 + 4^2 = C^2$$

$$4 + 16 = C^2$$

$$20 = C^2$$

$$4.5 \text{ N} = C$$



Applying this to airplanes...

- A plane is flying north at a velocity of 800 km/hr. The wind is blowing east at a velocity of 14 km/hr. What is the resultant vector? What does this mean?

